

ESME Workbench Innovations

David C. Mountain, Ph.D.

Department of Biomedical Engineering

Boston University

44 Cummingtown St.

Boston, MA 02215

phone: (617) 353-4343 fax: (617) 353-6766 email: dcm@bu.edu

Award Number: N000140910487

<http://www.bu.edu/hrc/research/laboratories/auditory-biophysics/>

LONG-TERM GOALS

The goal of this project is to enhance the flexibility and computational efficiency of the ESME Workbench and to work with NUWC-Newport to merge the NEMO and ESME approaches into the “One Navy Model”. The “One Navy Model” is intended to serve as the standard simulation system for use in predicting impacts of anthropogenic sound sources on marine life for environmental compliance purposes.

OBJECTIVES

Two versions of the One Navy Model will be created. The first version will be designed for use by the US Navy and its subcontractors (classified version) and the second version will have equivalent functionality but will not use data or software codes that are classified or otherwise not available to the general public (unclassified version). After acceptance by NUWC, the features and algorithms in these software packages will remain unchanged during the current permitting cycle for US Navy training exercises while a third version of the simulation software (research version) will continue to evolve.

APPROACH

This proposal builds on the ongoing development of the ESME Workbench and is focused on redesigning and enhancing our existing code base to meet current Navy needs for simulating the impact of sound on marine animals.

The software is designed to fulfill the requirements set out in the document *Marine Species Modeling Team Requirements for the Marine Acoustic Effects Simulator Version 1* (4 June 2010). The acoustic modeling for the Classified Model will conform to the document *Business Rules – Tactical Training Theater Assessment and Planning (TAP) Program Phase II Version 1* (4 June 2010).

The ESME Workbench is organized as a group of major software subsystems. Figure 1 illustrates the conceptual model that is being used to design the ESME system.

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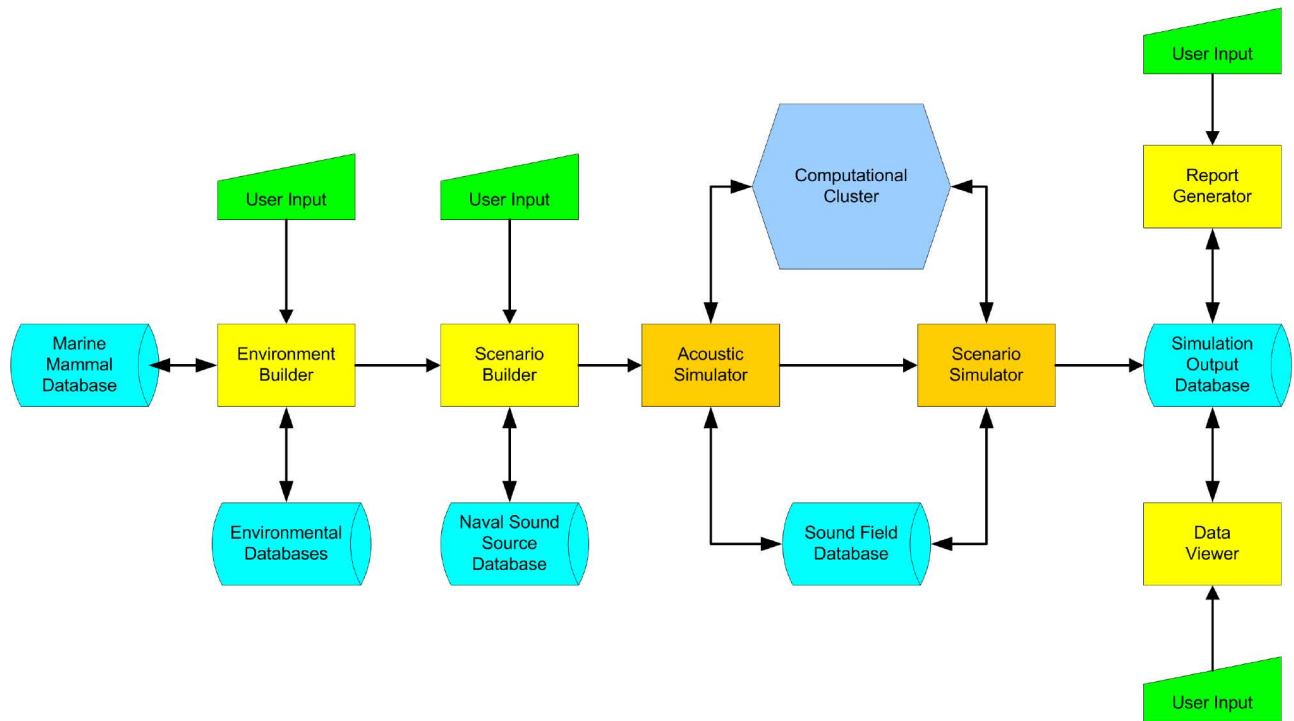


Figure 1. ESME Workbench conceptual block diagram

WORK COMPLETED

The original goal of this project was to predict the number of animals exposed to sound levels that would permanently or temporarily damage their hearing. Recent changes in the regulatory environment has shifted the goal to being able to predict behavioral impacts which means that sound fields have to be predicted over much larger areas. In addition, we need to be able to simulate longer and more complex training exercises than previously anticipated. This has required us to make major changes to the core software architecture of the ESME Workbench. The system has been redesigned using reusable components with the result that system performance and scalability has been greatly improved.

We have also redesigned the user interface to bring a more familiar user experience to the Workbench. We have chosen to use the ribbon style interface originally developed by Microsoft. We made this choice because our potential user community will be familiar with products from companies like Microsoft, ESRI, and Autodesk. This approach has also greatly improved the ease with which we can change the interface as we get feedback from the potential user community. We have also added the capability import data from a range of different standard GIS data formats and environmental data sources.

RESULTS

We have created the prototype for a new scalable simulation system for studying the interaction between anthropogenic sound and marine life.

IMPACT/APPLICATIONS

The ESME Workbench was originally conceived of as a general purpose research tool for use by those who wish to study the effects of sound in the marine environment. The initial development efforts have focused on the impact of naval sound sources on the hearing and behavior of marine mammals. During the current fiscal year, the development effort has been focused on working with the NEMO team at NUWC-Newport to combine the NEMO and ESME approaches into a single “One Navy Model” that will be used to simulate naval training exercises for environmental compliance purposes based on reporting requirements that are being negotiated between N45 and the National Marine Fisheries Service.

RELATED PROJECTS

Principal Investigator	Award Number	File Name
Michael Porter	N0001409C0412	MBporter
Martin Siderius	N000140910485	MBsideri

PUBLICATIONS

Mountain, D.C., Anderson, D., Cross, M. Houser, D.S., Porter, M.B. and Siderius, M. (2009). The ESME Workbench: A Simulation Tool for the Study of the Impact of Sound in the Maine Environment. Proceedings of the Society for Marine Mammalogy. 18th Biennial Conference. Quebec City, Canada, October 12-16, 2009.

David Anderson, Andrew Brughera, Matthew Cross, Dorian S. Houser, Nael Musleh, Michael Porter³, Martin Siderius, David C. Mountain (2010). The ESME Workbench: Simulating the Impact of Anthropogenic Sound on Maine Mammals. Proceedings of the Second International Conference on the Effects of Noise on Aquatic Life. Cork, Ireland, August 15-20, 2010.